

CLAIMS

What is claimed is:

1. A magnetoresistance sensor structure comprising:
a magnetoresistance sensor having a sensor surface plane and comprising
a free layer;
an upper antiferromagnetic layer overlying at least a portion of the free
5 layer; and
an upper ferromagnetic layer overlying and contacting at least a portion of
the upper antiferromagnetic layer on a contact face lying parallel to the sensor
surface plane, so that the upper antiferromagnetic layer lies between the upper
ferromagnetic layer and the free layer.
2. The magnetoresistance sensor structure of claim 1, wherein the
upper antiferromagnetic layer is PtMn and the upper ferromagnetic layer is CoFe.
3. The magnetoresistance sensor structure of claim 1, wherein the
magnetoresistance sensor is a giant magnetoresistance sensor.
4. The magnetoresistance sensor structure of claim 1, wherein the
upper antiferromagnetic layer and the upper ferromagnetic layer overlie a first
portion of the free layer that is less than all of the free layer, and further including
a cap layer overlying a second portion of the free layer.
5. The magnetoresistance sensor structure of claim 1, wherein the
magnetoresistance sensor is a tunnel magnetoresistance sensor.
6. The magnetoresistance sensor structure of claim 1, wherein the
upper antiferromagnetic layer and the upper ferromagnetic layer overlie
substantially all the free layer, and further including
a cap layer overlying the upper ferromagnetic layer.

- 5 7. A magnetoresistance sensor structure comprising:
a magnetoresistance sensor having a sensor surface plane and comprising:
a lower antiferromagnetic layer, and
a free layer overlying the lower antiferromagnetic layer;
an upper antiferromagnetic layer overlying at least a portion of the free
10 layer; and
an upper ferromagnetic layer overlying and contacting at least a portion of
the upper antiferromagnetic layer on a contact face lying parallel to the sensor
surface plane, so that the upper antiferromagnetic layer lies between the upper
ferromagnetic layer and the free layer.
8. The magnetoresistance sensor structure of claim 7, wherein the
lower antiferromagnetic layer and the upper ferromagnetic layer are made of the
same material.
9. The magnetoresistance sensor structure of claim 7, wherein the
lower antiferromagnetic layer and the upper antiferromagnetic layer are both
PtMn.
10. The magnetoresistance sensor structure of claim 7, wherein the
upper ferromagnetic layer is CoFe.
11. The magnetoresistance sensor structure of claim 7, wherein the
magnetoresistance sensor is a giant magnetoresistance sensor.
12. The magnetoresistance sensor structure of claim 7, wherein the
upper antiferromagnetic layer and the upper ferromagnetic layer overlie a first
portion of the free layer that is less than all of the free layer.
13. The magnetoresistance sensor structure of claim 7, wherein the
upper antiferromagnetic layer and the upper ferromagnetic layer overlie a first
portion of the free layer that is less than all of the free layer, and further including

a cap layer overlying a second portion of the free layer.

14. The magnetoresistance sensor structure of claim 7, wherein the upper antiferromagnetic layer and the upper ferromagnetic layer overlie a first portion of the free layer that is less than all of the free layer, and further including a lead layer overlying the upper ferromagnetic layer.

15. The magnetoresistance sensor structure of claim 7, wherein the upper antiferromagnetic layer and the upper ferromagnetic layer overlie a first portion of the free layer that is less than all of the free layer, and further including a lead layer overlying the upper ferromagnetic layer, and
5 a cap layer overlying a second portion of the free layer.

16. The magnetoresistance sensor structure of claim 7, wherein the magnetoresistance sensor is a tunnel magnetoresistance sensor.

17. The magnetoresistance sensor structure of claim 7, wherein the upper antiferromagnetic layer and the upper ferromagnetic layer overlie substantially all the free layer, and further including a cap layer overlying the upper ferromagnetic layer.

18. A magnetoresistance sensor structure comprising:
a magnetoresistance sensor having a sensor surface plane, a transverse direction lying in the sensor surface plane, and a longitudinal direction lying perpendicular to the transverse direction and in the sensor surface plane, the
5 magnetoresistance sensor comprising:

a transverse biasing stack including a lower antiferromagnetic layer,
and

a free layer overlying the transverse biasing stack; and

a longitudinal biasing stack overlying the magnetoresistance sensor, the
10 longitudinal biasing stack comprising:
an upper antiferromagnetic layer, and

an upper ferromagnetic layer overlying and contacting at least a portion of the upper antiferromagnetic layer on a contact face lying parallel to the sensor surface plane, so that the upper antiferromagnetic layer lies between the upper ferromagnetic layer and the magnetoresistance sensor.

19. The magnetoresistance sensor structure of claim 18, wherein the magnetoresistance sensor is a giant magnetoresistance sensor.

20. The magnetoresistance sensor structure of claim 18, wherein the magnetoresistance sensor is a tunnel magnetoresistance sensor.